9/0B POWER SUPPLY VARIABLE LOAD

KEPCO LAB

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MODEL 910B

SERIAL .....

KEPCO LABORATORIES, INC.
131 - 38 Sanford Avenue
Flushing 55, New York

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POWER SUPPLY VARIABLE LOAD

MODEL 910B

The Kepco Power Supply Variable Load is an electronic load which operates in the range 0-600 volts from 0-600 milliamperes. Provision is made for automatically modulating the electronic load 10 seconds on and 10 seconds off. In addition, the electronic load can be internally modulated with a 60 cycle square wave or externally modulated with a signal of any waveform.

SPECIFICATIONS:

ELECTRONIC LOAD: The electronic load is a vacuum tube load. The voltage from the power supply under test is connected to the plates of the vacuum tube load. The load is varied from 0-600 milliamperes by varying the grid bias of the tubes in the electronic load. With this load, 600 milliamperes may be drawn from the power supply under test in the range 0-600 volts. For any particular setting of load current, the grids of the vacuum tube load are controlled by an amplifier which maintains the current drawn from the power supply under test essentially constant over the entire voltage range 0-600 volts. An internal power supply is connected in series with the bank of load tubes which assures adequate plate voltage so that the full load current can be drawn when the applied voltage is 0 volts.

Provision for internal and external modulation of the electronic load is included. The load may be modulated in the following manner:

1. Manually by an on-off switch located on the front panel. This switch can be activated in either of two ways - momentary or positive acting. Provision is made for remote switching of the load on and off. The connector for this purpose is located on the rear of the chassis.

2. An internal timer automatically switches the load alternately ten seconds on and ten seconds off.

3. External modulation by means of a signal of any waveform (Sine wave 10 cycles to 100 KC, Square wave 20 cycles to 10 KC). The amplitude of the signal required for complete modulation from 0 to 600 MA is approximately 3 volts peak to peak.

4. Internal modulation by a 60 cycle square wave.

5. Modulation by an internally generated square wave triggered by an external signal over the frequency range 5 cycles to 5 kilocycles. External triggering requires a signal of approximately 3 to 10 volts peak to peak. This signal may be sine wave, square wave or any symmetrical wave shape.

All modulation signals are clamped in such a manner that modulation is from maximum load to minimum load. The maximum load current as set by the maximum load control will never be exceeded, providing the modulating signal amplitude is no larger than that necessary to swing from full load to 0 load.

DC INPUT VOLTAGE

VOLTAGE: 0-600 volts.

CURRENT: 0-600 milliamperes continuous duty.

FUSE PROTECTION: Input power fuse protects the internal power supplies.

OVERLOAD CIRCUIT BREAKER: This circuit breaker is located on the front panel and serves as a load on-off switch and current overload breaker. This breaker will open when the load exceeds 75 MA or 650 MA, depending on the current meter range setting, 60 MA or 600 MA respectively.

POWER REQUIREMENTS: 105-125 volts, 50-65 cycles.

TERMINATIONS

INPUT TERMINATIONS: A 5-pin AN connector on the rear of the chassis is provided for connecting to the power supply under test.

OUTPUT TERMINATIONS: A 3-pin AN connector on the rear of the chassis provides for connection of the power supply under test to auxiliary equipment for measuring regulation ~~and ripple~~ (such as Kepco Model 901B Regulation Analyzer).

REMOTE SWITCHING TERMINATIONS: A 4-terminal connector on the rear of the chassis provides for remote switching. Two terminals must be externally shorted at the desired interval to apply maximum load. 115 volts AC is available on the connector for operating an external timing motor.

EXTERNAL MODULATION TERMINATIONS: A BNC connector, located on the front panel, is provided for connection to an external signal generator. This signal may be used to directly modulate the load or to trigger the internally generated square wave.

CURRENT MONITOR TERMINATIONS: Two 5-way binding posts on the front panel may be used to observe the load current waveform with an oscilloscope or recorder. These terminals are connected across the

current sensing resistor in series with the load. This resistor is 100 ohms for the 60 MA range and 10 ohms for the 600 MA range.

AUXILIARY TERMINATIONS: An 18-pin connector, located on the rear of the chassis, provides for connection to auxiliary units in order to extend the voltage and/or current range of the Kepco Model 910B Power Supply Variable Load.

METERS:

Voltmeter: Dual range - 0-150 volts, 0-600 volts;
Weston 4" rectangular, 2% accuracy.

Ammeter: Dual range - 0-60 milliamperes, 0-600 milliamperes.
Weston 4" rectangular, 2% accuracy.

CONTROLS:

Power on-off switch for internal power supplies and amplifiers.

Load on-off circuit breaker (magnetic type).

Manual on-off load switch - momentary or positive acting.

Minimum and maximum load current controls. These controls are 3-turn potentiometers which allow the precise setting of the high and low current limits. For example: 0-600 MA., 75-500 MA., etc.

Mode of operation switch - five-position rotary:

POSITION 1 - MANUAL/REMOTE: Provides for either manual or remote switching of the load current.

POSITION 2 - AUTO: Provides an automatic timing cycle, ten seconds on and ten seconds off, which pulses the load from minimum to maximum current.

POSITION 3 - EXT. MOD.: Provides for modulation from an external signal generator.

POSITION 4 - INT. 60 ⊓⊔ MOD.: Provides internal 60 cycle square wave modulation (line frequency).

POSITION 5 - INT. ⊓⊔ MOD./EXT. TRIG.: Provides for internal square wave modulation, the repetition rate of which is determined by the frequency of an external triggering signal.

Voltmeter Switch - Two-position: 0-150 volts or 0-600 volts.

Milliammeter Switch - Two-position: 0-60 MA. or 0-600 MA.

Internal Square Wave Modulation Amplitude Control - Continuously variable control adjusts the amplitude of the internally generated square wave so that the load can be stepped from maximum load to any desired minimum load.

PHYSICAL SPECIFICATIONS: Height 8-3/4", width 19". Color Kepco standard gray hammertone. This unit is designed for relay rack mounting or bench use. Carrying handles are provided.

OPERATING INSTRUCTIONS: The Kepco Model 910B Power Supply Variable Load is shipped with all tubes in place and is ready for operation.

OPERATING PROCEDURE:

1. Wire the input connector in accordance with Schematic Drawing No. S-910B-04. Connect the input cable to the power supply under test. Turn the mode of operation switch to MAN./REMOTE position. Select the current range, either 60 MA. or 600 MA., and turn the load current MIN. and MAX. controls completely counter-clockwise Set the MAX. load switch in the OFF position. Place the overload circuit breaker in the OFF position. Select the proper voltmeter range.

2. Turn on the power switch. Wait approximately one minute for all tube filaments to come to operating temperature. Turn on the overload circuit breaker. Turn on the power supply under test. Adjust the MIN. load current control for minimum load. Switch the MAX. load switch to the ON position and set the MAX. load current control for the maximum current desired. The minimum and maximum settings will drift slightly during the first 15 minutes of operation of this unit so that it may be necessary to make slight adjustments in these controls.

The load current set by the MAX. control adds to the current set by the MIN. control. An increase in the setting of the MIN. control will increase the maximum current by the same amount.

3. For momentary stepping of the load current from minimum to maximum limit, set the mode of operation in the MAN./REMOTE position. Depress the MAX. LOAD switch in the MOM. ON position. Releasing pressure on this switch returns the load current to the minimum setting

4. For automatic stepping of the load current from minimum to maximum, place the mode of operation switch in the AUTO. position. The load current will then be automatically stepped from the low limit to the high limit, 10 seconds in the low limit position followed by 10 seconds in the high limit position, with the cycle repeating itself every 20 seconds.

The minimum-maximum current intervals can be adjusted by adjusting the automatic timer cam. The automatic switching interval is fixed at 20 seconds. The cam may be set so that the timing interval may be adjusted through the range 1 second MIN. and 19 seconds MAX., to the

other extreme of 19 seconds MIN. and 1 second MAX. The timer is located on the top front of the chassis and can be reached by removing the perforated cover.

5. For remote stepping of the load current from minimum to maximum, connect a single pole-single throw switch or relay to the Jones connector P304 across Pins #1 and #4. Set the mode of operation switch in the MAN./REMOTE position. Set the MAX. LOAD switch in the OFF position. Closing the remotely located switch or relay will step the load current from the minimum setting to the maximum setting.

6. For external modulation of the load current connect the modulating signal through the BNC connector labelled EXT. MOD. The load may be modulated with a sine wave through the frequency range 10 cycles to 100 KC without distortion, and up to 1 megacycle with some distortion. A square wave through the frequency range 20 cycles to 10 KC may be applied. The signal amplitude required for complete modulation is approximately 3 volts peak to peak. The modulating signal amplitude must be adjusted so that the signal is no larger than that necessary to swing from full load to 0 load. If the signal is larger it will shift the maximum load level. The current reading on the ammeter will indicate the RMS value of the current.

To determine the minimum current level, it is necessary to connect a DC oscilloscope to the current monitor terminals and examine the current pulse. The negative terminal of the current monitor is at B- potential. The ground terminal of the scope should be connected to the current monitor negative terminal to avoid spurious signal pickup. The current monitor terminals can only be used when the minus of the power supply under test

is close to ground potential. In power supplies where the positive terminal is at ground potential, it is recommended that a resistor be put in series with the + load terminal to monitor the current. In order to calibrate the scope, set the mode of operation switch in the MAN. position. Set the load current for 0 load and set the DC scope trace to a convenient 0 position on the scope screen. Adjust the load current to the MAX. position. Return the mode of operation switch to the EXT. MOD. position, and the minimum current level can be determined from the scope trace.

7. For internal 60 cycle square wave modulation, turn the mode of operation switch to the INT. 60 ⊓⊔ MOD. position. Adjust the INT. MOD. amplitude control to the desired minimum load current. The current reading on the ammeter will indicate the RMS value of the current.

To determine the minimum current level, it is necessary to connect a DC oscilloscope to the current monitor terminals and examine the current pulse. The negative terminal of the current monitor is at B- potential. The ground terminal of the scope should be connected to the current monitor negative terminal to avoid spurious signal pickup. The current monitor terminals can only be used when the minus of the power supply under test is close to ground potential. In power supplies where the positive terminal is at ground potential, it is recommended that a resistor be put in series with the + load terminal to monitor the current. In order to calibrate the scope, set the mode of operation switch in the MAN. position. Set the load current for 0 load and set the DC scope trace to a convenient 0 position on the scope screen. Adjust the load current to the MAX. position. Return the mode of operation switch to the INT. 60 ⊓⊔ MOD. position, and the minimum cur-

rent level can then be determined from the scope trace.

8. For internal square wave modulation with external triggering, set the mode of operation switch to the INT. ⌐⌙ MOD./EXT. TRIG. position. The internal square wave generator can be triggered by an external signal over the frequency range 5 cycles to 5 KC. This external triggering signal may be a sine wave, a square wave or any symmetrical wave shape whose amplitude is approximately 3 to 10 V peak to peak. Adjust the INT. MOD. amplitude control to the desired minimum load current. The current reading on the ammeter will indicate the RMS value of the current.

To determine the minimum current level, it is necessary to connect a DC oscilloscope to the current monitor terminals and examine the current pulse. The negative terminal of the current monitor is at B- potential. The ground terminal of the scope should be connected to the current monitor negative terminal to avoid spurious signal pickup. The current monitor terminals can only be used when the minus of the power supply under test is close to ground potential. In power supplies where the positive terminal is at ground potential, it is recommended that a resistor be put in series with the + load terminal to monitor the current. In order to calibrate the scope, set the mode of operation switch in the MAN. position. Set the load current for 0 load and set the DC scope trace to a convenient 0 position on the scope screen. Adjust the load current to the MAX. position. Return the mode of operation switch to the INT. ⌐⌙ MOD./EXT. TRIG. position, and the minimum current level can then be determined from the scope trace.

MAINTENANCE: The components of the Model 910B Power Supply

Variable Load have been selected and tested to provide long and trouble free operating life. The only service necessary should be the replacement of vacuum tubes. The location of the tubes is clearly marked on the chassis.

The current range of the Variable Load is determined by a factory adjustment of two multi-turn potentiometers located on the amplifier assembly and labelled H and L. Their settings should not be changed except to compensate for variations in reference tubes. When it is necessary to readjust the current range the procedure to be followed is:

1. With the power supply turned off, short the input connector + and - terminals. CAUTION -- With the overload circuit breaker in the ON position approximately 120 volts DC appears across the input terminals and, therefore, the circuit breaker should be turned off when shorting the input terminals.

2. Place the manual on-off load switch in the OFF position and set the milliammeter range switch to the 600 MA position.

3. Turn on the power switch and allow approximately 15 minutes for the reference tubes and all components to reach equilibrium.

4. Turn the MIN. load control, located on the front panel, to the extreme counter-clockwise position and adjust the potentiometer labelled L until the milliammeter reads 0.

5. Turn the manual on-off load control to the ON position and turn the MAX. load control to the extreme clockwise position. If the current meter does not read 600 MA, adjust the potentiometer labelled H until the milliammeter reads 600 MA. (Clockwise rotation increases the current)

6. Turn the manual on-off switch to the OFF position. If the current is not 0 repeat steps 4 and 5 until the desired range 0-600 MA is obtained.

REPAIRS: Should any trouble develop in the instrument, it may be serviced with the aid of the schematic diagram. Major repairs, however, are usually handled by the factory.

Under no circumstances should the instrument be returned to the factory without proper authorization and shipping instructions. In any correspondence with the factory concerning repairs, the type and serial number of the instrument must be given together with a description of the trouble encountered.

ADDENDUM

OPERATING PROCEDURE: (Paragraphs 6, 7 and 8)

For greatest accuracy in determining maximum and minimum current when modulating the load, it is necessary to read these values from the DC oscilloscope, calibrated as described above. Some readjustment of the maximum current control may be required.

For modulating at high frequencies, maximum response will be obtained in the 0-600 MA position.

PARTS LIST - MODEL 910B

DRAWING S-910B-01

C1	- 0.1	MF	500 WV
C2	- 47	MMF	1000 WV
C3	- .005	MF	2000 WV
C4	- 0.25	MF	600 WV
R1	- 680	K	1/2 watt
R2	- 10	K	1/2 watt
R3	- 200	K	1/2 watt
R4	- 33	K	1 watt
R5	- 22	K	2 watt
R6	- 15	K	1 watt
R7	- 330	K	1/2 watt
R8	- 150	K	1/2 watt
R9	- 2.2	Meg.	1/2 watt
R10	- 16	K	1 watt
R11	- 125	K	1/2 watt WW
R12	- 50	K	0.8 watt WW Trimpot
R13	- 150	K	1/2 watt WW
R14	- 68	K	1/2 watt WW
R15	- 10	K	0.8 watt WW Trimpot
R16	- 27	K	1 watt
R17	- 27	K	1 watt
R18	- 16	K	1 watt
R19	- 39	K	2 watt
R20	- 39	K	2 watt
R21	- 12	K	2 watt
R22	- 100	Ohm	1 watt
R23	- 10	K	2 watt
R24	- 10	K	1 watt
R25	- 39	K	2 watt
R26	- 8.5	K	10 watt WW
R27	- 68	K	1 watt

V1	- 12AU7
V2	- 12AT7
V3	- 12AT7
V4	- 12AT7
V5	- 6CL6
V6	- 6CL6

PARTS LIST - MODEL 910B

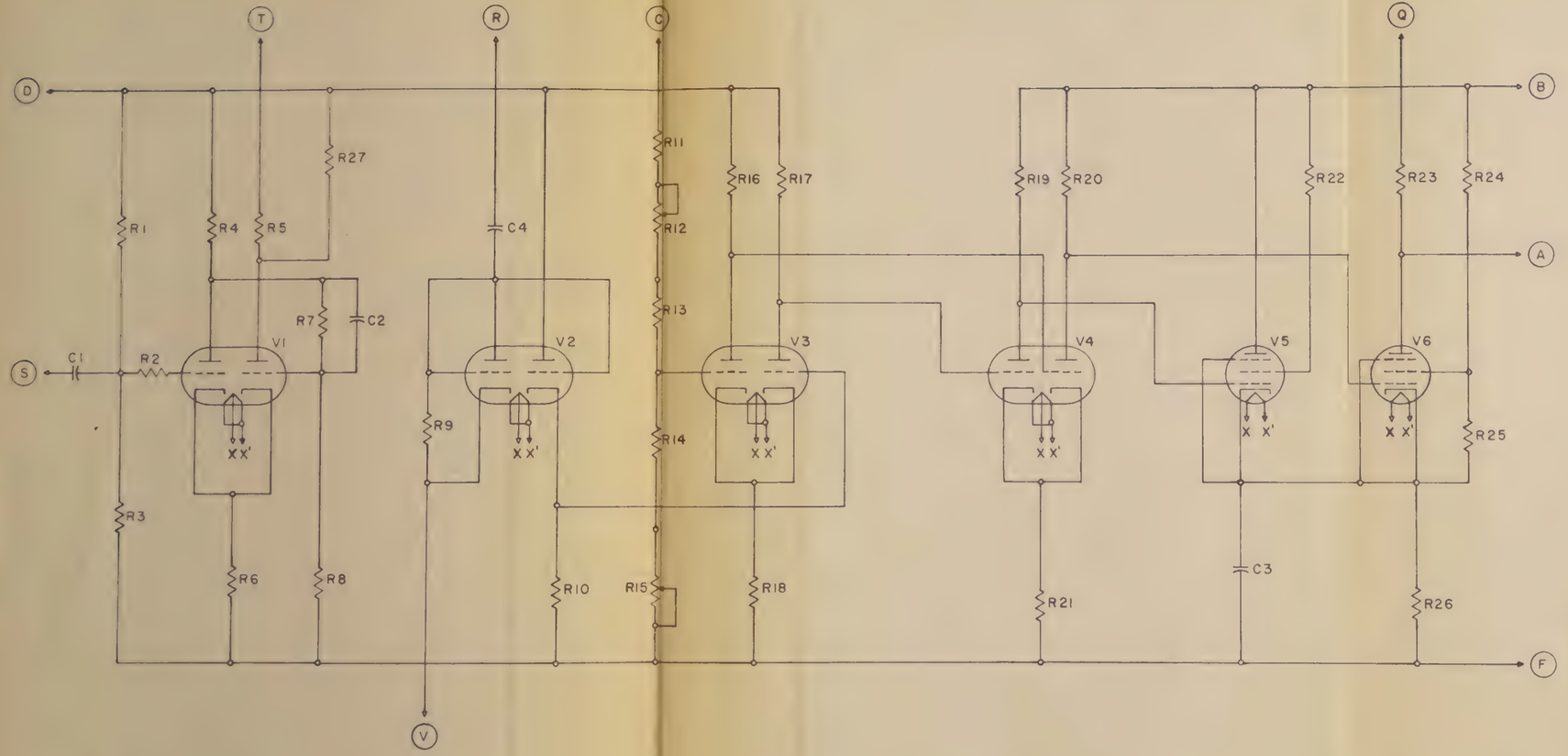
DRAWING S-910B-02

C51	- 500	MMF	2000 WV
C52	- 0.1	MF	500 WV
C53	- 0.1	MF	500 WV
C54	- .001	MF	2000 WV
R51	- 9	K	20 watt WW
R52	- 470	Ohm	2 watt
R53	- 100	Ohm	1 watt
R54	- 100	K	1/2 watt
R55	- 180	K	1 watt
R56	- 560	K	1 watt
R57	- 82	K	1 watt
R58	- 60	K	20 watt WW
R59	- 390	K	1/2 watt
R60	- 390	K	1/2 watt
R61	- 82	K	1/2 watt
R62	- 250	K	1 watt
R63	- 100	K	1/2 watt
R64	- 82	K	1/2 watt
R65	- 250	K	1 watt
R66	- 250	K	1 watt
R67	- 20	K	10 watt
V51	- 5U4GB		
V52	- 5881		
V53	- 6C4		
V54	- 6AW8		
V55	- 12AX7		
V56	- 85A2		

PARTS LIST - MODEL 910B

DRAWING S-910B-03

C101	- 500	MF	200 WV
C102	- 0.25	MF	3000 WV
C103	- 100	MF	300 WV
C104	- 8	MF	1000 WV
C105	- 4	MF	1000 WV
C106	- .001	MF	1000 WV
CB101	- Circuit Breaker, 75 MA DC		
F101	- 7 Amp. Fuse Slow Blow		
GR101	- Germanium Rectifier GE #4JA211CC1AC1		
J101	- BNC Connector		
M101	- Meter, 0-60-600 MA DC		
M102	- Meter, 0-150-600 V DC		
P1	- Plug, U. S. Comp. #990-18MS		
PL101	- Neon Pilot Light NE-2		
PL102	- Neon Pilot Light NE-2		
R101	- 10	Ohm	50 watt WW
R102	- 2	K	10 watt WW
R103	- 20	Ohm	10 watt WW Adj.
R104	- 1.2	Meg.	2 watt
R105	- 2.5	K	2 watt Pot.
R106	- 5	K	3 turn Pot.
R107	- 5	K	3 turn Pot.
R108	- Omitted		
R109	- 100	Ohm	10 watt WW
R901	- 47	Ohm	1 watt
R902	- 560	Ohm	1 watt
R903	- 100	Ohm	1 watt
R904	- 10	Ohm	1 watt
RL101	- DPDT Relay		
S101	- SPST Toggle Switch		
S102	- 3 Pole 6 Pos. Rotary Switch		
S103	- SPDT Toggle Switch		
S104	- 3PDT Toggle Switch		
S105	- SPDT Toggle Switch		

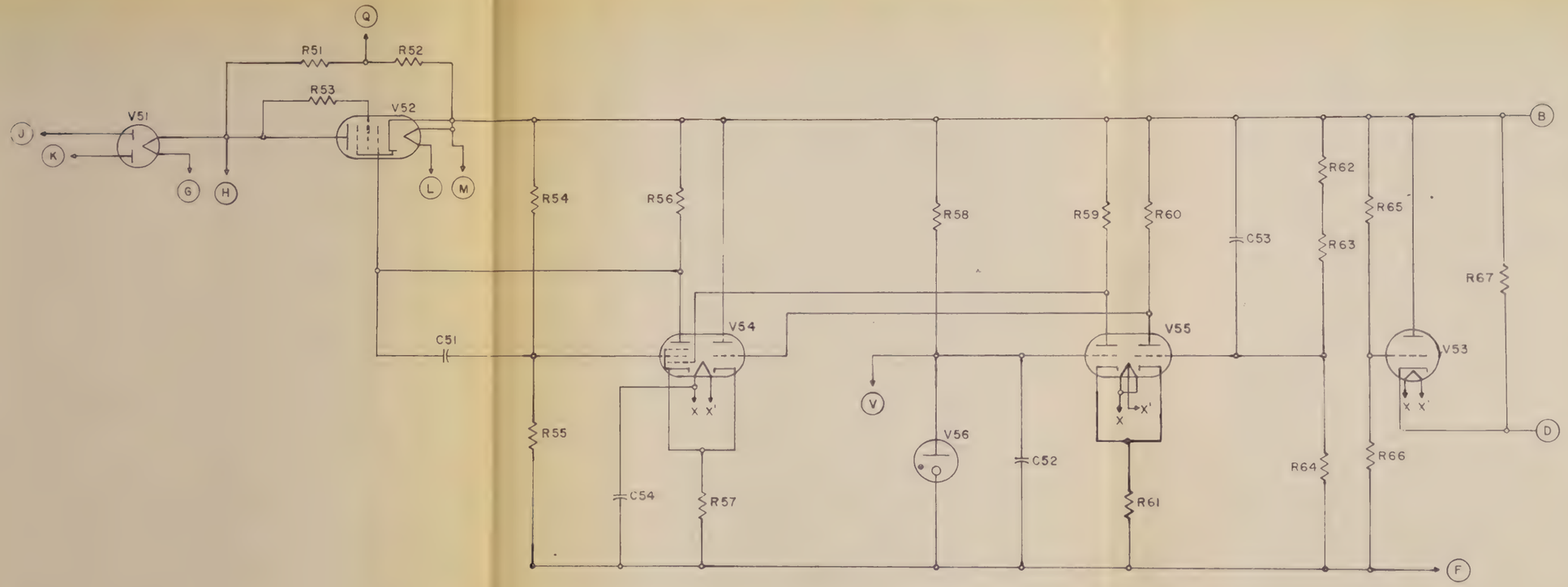


LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS TO CORRESPONDING POINTS ON DRAWINGS S-910B-02, AND S-910B-03

KEPCO LABORATORIES

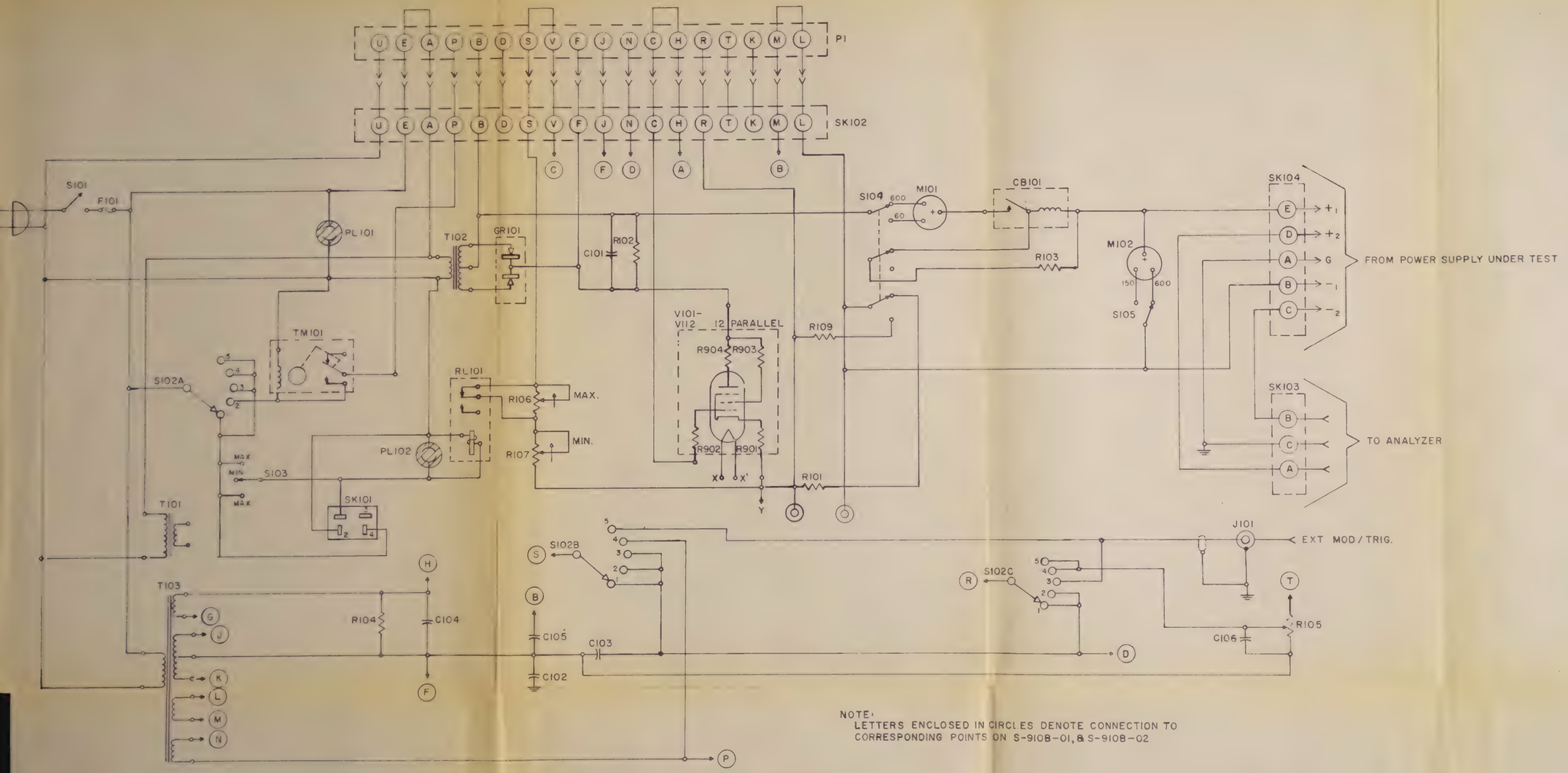
FLUSHING NEW YORK

ITEM: CONSTANT CURRENT AMPLIFIER	DES K. Y.
	APPD K.K. 3-18-58
MODEL 910B	DFTM W.V.D.
DWG. No. S-910B-01	CHKD J.G.



LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS TO COPRESPONDING POINTS ON DRAWINGS S-910B-01, AND S-910B-03

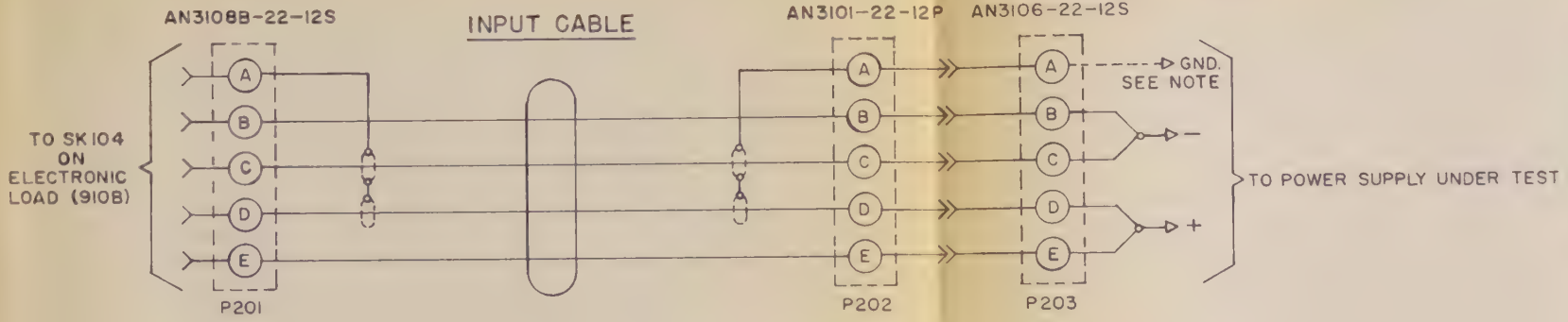
KEPCO LABORATORIES	
FLUSHING	NEW YORK
ITEM: POWER SUPPLY AMPLIFIER	DES. J. R. G.
	APPD K.K. 2-17-58
MODEL 910B	DFTM W.V.D.
DWG. No. S-910B-02	CHKD J. G.



NOTE:
LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTION TO CORRESPONDING POINTS ON S-9108-01, & S-9108-02

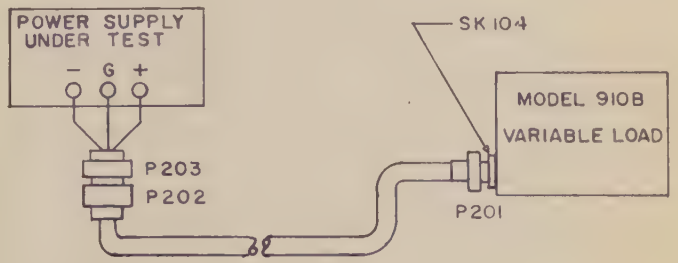
KEPCO LABORATORIES	
FLUSHING	NEW YORK
ITEM: ELECTRONIC LOAD	DES J.R.G.
	APPD K.K. 3-18-58
MODEL 9108	DFTM W.V.D.
DWG. No S-9108-03	CHKD J.G.

INPUT CONNECTIONS FOR
MODEL 910B WHEN USED
IN CONJUNCTION WITH MODEL
901B ANALYSER.



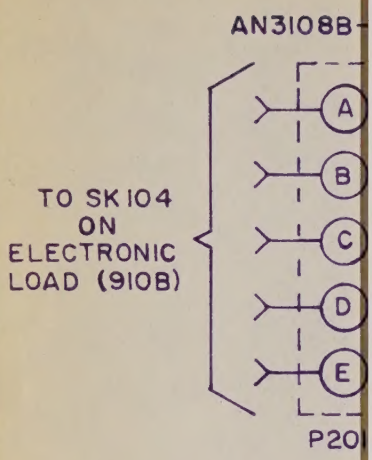
NOTE
IF MODEL 910B IS USED ALONE,
ADD GROUND CONNECTION TO
PIN 'A' OF P203.

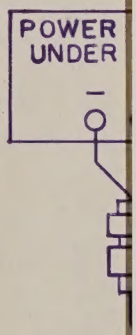
BLOCK DIAGRAM



FOR BLOCK DIAGRAM OF TEST SET-UP USING MODEL 901B
ANALYSER IN CONJUNCTION WITH MODEL 910B VARIABLE LOAD,
SEE MODEL 901B INSTRUCTION MANUAL.

KEPCO LABORATORIES		
FLUSHING		NEW YORK
ITEM: CABLE SCHEMATIC & BLOCK DIAGRAM	DES	GROUP
	APPD.	POCKET
	DFTM. W.V.D.	FOLDER
MODEL 910B	CHKD. J.R.G.	ORIGINALS
DWG. NO. S-910B-04	DATE 7-26-57	SHEET OF





FOR BLO
ANALYSE
SEE MOD